



## TECHNICAL ARCHITECTURE REVIEW

<b>Project Name:</b>	<b>Application Servers</b>
<b>Requestor:</b>	Kevin Van Ausdal
<b>Date of Initial Request:</b>	December 19, 2007
<b>Request Description:</b>	Application Server environments that are compatible with JEE 5 provided some needed functionality for the Tax Commission. Tax needs an environment that supports EJB3 containers. What is the preferred direction for the State in meeting these requirements?
<b>Agency or Agencies:</b>	Utah Tax Commission, and the State Enterprise
<b>Reviewers:</b>	Bob Woolley and Dave Fletcher
<b>ARB Acceptance Date:</b>	
<b>Agency Requestor Acceptance Date:</b>	

### Introduction

Application server platforms are one of the most important categories of application platform software for the State. An application server platform is infrastructure software for building Web and composite applications and, increasingly, applications based on service-oriented architecture (SOA) design principles. An application server platform integrates an application server, which manages user requests, data access, and business logic, with portal servers and integration/business process management (BPM) servers. Integration with Enterprise Service Bus environments and other specialized services are also often available. Much of what has been done with application orchestration takes place within application server platforms.

Forrester<sup>1</sup> suggests that .NET and J2EE platforms comprise by far the largest segments of the application server marketplace. These markets are dominated by large vendors such as Microsoft, IBM, Sun, and Oracle.

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<sup>1</sup> Rymer, John R., The Forrester Wave: Application Server Platforms, Q3 2007, July 11, 2007; page 2.

Another large segment is the open source application server provider arena which is led by Tomcat, JBoss, Resin, and more recently GlassFish. All of these providers have a substantial base of reference installations. Needless to say, the State has implementations from all of these vendors in its application portfolio.

## Objectives and Scope of Review

The State has a substantial investment in J2EE application servers using open source and proprietary application server environments. J2EE has migrated to Java Enterprise Edition 5 (JEE5). The purpose of this review is to identify platforms that will support JEE5 application development, and suggest migration strategies from older application server environments. Application server environments from Microsoft, such as .NET, are not considered in this review.

## Baseline of Current Architecture

The State has a wide variety of application server and development environments. The Configuration Management Database (CMDB) lists at least 18 to 20 application server platforms within State agencies, and many more development environments. Among the frequently appearing environments are:

- BEA WebLogic
- Geronimo
- GlassFish
- JBOSS
- LAMP
- Microsoft IIS
- Oracle Application Server
- Resin
- SAP
- Sun Java Studio and Predecessors
- Sybase Adaptive Server and EA Server
- Tomcat
- Versata
- Web Sphere

Certainly the most common of these environments are some of the open source platforms from Apache, such as Tomcat. JBOSS is another popular environment. There are many applications developed on proprietary environments from Sun, IBM, and BEA. Fewer instances exist for Microsoft .NET, IIS, and Oracle. In any event, the environment is diverse but is dominated by J2EE platforms for both

proprietary and open source platforms. Having so many different application server platforms has also spawned a wide range of development IDEs.

While many of the commercial providers will migrate to JEE5, they will likely do so slowly. GlassFish is the reference version for a JEE5 application server and is sponsored by Sun as a contributed open source application server. Among the existing environments, only GlassFish and JBOSS are JEE5 compliant, and JBOSS is not fully certified.

## Best Practices Review

Application server platforms were invented to simplify development of Web applications. Forrester<sup>2</sup> suggests they are evolving to address two distinct sets of requirements:

- ***Scale up Web applications, and make them highly reliable at an efficient cost.*** As Web applications grow in usage, the costs of developing and running them can increase rapidly. Application server platform vendors have responded by adding features designed to eliminate specialized software and coding, speed up data-processing operations, and simplify both scalability and reliability under load.
- ***Provide a path to new Service Oriented Architecture (SOA) applications.*** The next generation of applications will add distributed computing features and new protocols to HTTP, HTML, XML, Web containers, and other foundations of Web applications. These digital business applications employ service-oriented architectures, sophisticated user experiences, BPM and business rules, IP application protocols, metadata management, event management, and other advanced features. These requirements represent the future of application server platforms.

Application servers from vendors and the open source community are all taking these factors into consideration as they release new products. Increasingly, these capabilities can be met with a wide array of products. Choices for the State in terms of application server use have gone far beyond the limited proprietary environments of the past.

Application development is also moving toward more SOA and composite application development and integration with external resources such as ESBs. Increasingly it is possible for the State to select an environment that is most appropriate for the intended scope and scaling requirement of the application. It is no longer a one size fits all platform marketplace.

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<sup>2</sup> *Ibid*, p. 4

The best practice is selection of an application server environment that has the features required by the client and will scale to meet the needs of the application owner and users. While this has always made sense, it has not always been practical. The State has been forced to use expensive application server environments for small applications with a small user clientele. This is no longer necessary.

Migrating to application servers that support JEE5 is a best practice and will be supported by all major Java application server providers.

## Emerging Technologies and Industry Trends

At JavaOne 2005, Sun announced Project GlassFish, an initiative to open source its Application Server and the JEE5 Reference Implementation. This was the first step of open sourcing the entire Java platform, but it also had other effects. Project GlassFish accelerated the adoption of JEE5 and added a new enterprise quality application server to the options available to the Open Source community.

Java Platform, Enterprise Edition version 5 (JEE5), was intended to simplify the complex J2EE platform. How well it has succeeded is a point with divergent views. Some analysts believe it is failing to do so, and others are much more favorable.

JEE5 focuses on making development easier, yet retains the richness of the J2EE platform. JEE5 offers new and updated features, such as:

- Enterprise JavaBeans (EJB) Technology 3.0;
- JavaServer Faces (JSF) Technology; and,
- the latest Web services APIs.

JEE5 makes coding simpler and more straightforward, but maintains much of the power that has established J2EE as a dominant platform for Web services and enterprise application development. The JEE5 SDK and Java Application Platform SDK provide support for JEE5 specifications, and the Java Application Platform SDK features additional runtimes such as Open ESB, Portlet Container, and Sun Java System Access Manager.

While all of these features are useful it is important to note that they do not impact a large percentage of existing applications. A less feature rich application server environment, such as Tomcat, still meets many agency requirements for a Java application server for typical agency applications.

Major vendors have announced migration to JEE5, so it is likely to become the de facto standard in the future for Java application servers. Choosing an application server environment that meets specific user requirements is the most

cost effective for most agencies. Large vendor specific environments tend to be feature rich and highly scalable. Those capabilities do not impact greater than 10-20% of the existing application portfolio of the State.

## Financial Analysis

The State is currently spending well in excess of \$1,000,000 per year for licensing and maintenance of proprietary application server environments. The diversity of these environments, and the corresponding complexity for staff training and IDEs, is very high.

Many agency applications are small, so Tomcat has emerged as a preferred environment since it provides both scalability, low cost of entry, and low maintenance expense. For agencies that wish to migrate to fully functional JEE5 environments, GlassFish and JBOSS become strong contenders without large licensing and support costs.

## Security Review and Analysis

Security issues for application servers vary by product, but in general, security for this genre of products has been fairly well understood. Security for SOA implementations, composite application development, and Web services is not as well understood and represents an ongoing security risk to the State. This risk can be reduced if application server deployment is confined to fewer platforms.

## Operational and Infrastructure Analysis

Operations have a near impossible task supporting and maintaining the current diverse range of application server environments at the State. From a management and cost perspective, it would be in the best interest of the State to simplify the current environment.

## Solution Delivery Impact and Analysis

Solutions delivery has a clear benefit if they are able to write for fewer platforms and can simplify the current IDE environment. From a practical perspective, they have already done so and provide only the most limited options for the 18 to 20 application server platforms currently available.

## Agency Services Impact and Analysis

Agencies have specific applications that need to be developed. Line of business managers typically care about cost and getting the results desired from an application. They typically do not care about specific platform preferences of IT. Use of a familiar and supported platform is generally considered to be beneficial.

## Summary and Recommendations

Nationally, Forrester<sup>3</sup> has reported that 46% of custom development is taking place on .NET platforms and 30% on Java platforms. At the State this number is heavily oriented toward Java because of existing skill sets and past development projects. From a development perspective, the State is likely to support both .NET and Java application server platforms for the near future. That being the case, it is in the best interest of the State to migrate from the older application server environments to newer technologies.

The table that follows suggests an application server migration strategy:

Application Server	Migrate To	Sustained
BEA WebLogic		Maintain Current Use
Geronimo	GlassFish	
JBOSS	GlassFish	
Microsoft IIS and Predecessors	.NET Framework	
Oracle Application Server		Maintain Current Use
Other Application Servers	GlassFish	
Sun One and Predecessors	GlassFish	
Sybase Adaptive & EA Server	GlassFish	
SAP		Maintain Current Use
Tomcat		Maintain Current Use
Versata		Maintain Current Use
Web Sphere		Maintain Current Use

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<sup>3</sup> *Ibid*, p. 3

The current State application server and development environment is unduly complex and is not a financially viable approach from a management, support, or training perspective.

The recommendations from this review are to:

- reduce the number of supported development environments and application servers across all agencies;
- migrate from J2EE to JEE5 development;
- use GlassFish as a standard JEE5 application server development platform;
- integrate GlassFish with the UMD and other relevant enterprise services;
- implement production, acceptance testing, and development environments for GlassFish;
- use other application server platforms only when they provide unique values and capabilities or have been specifically integrated with other existing State software environments such as FINET;
- identify approved IDEs for use with GlassFish across State agencies;
- minimize new development in sustained environments;
- recommend JEE5 as a standard development platform; and,
- support .NET framework resources as an approved development platform.

Implementation of these recommendations will facilitate a common focus on JEE5 as an ongoing development environment and it will allow agencies to use a smaller number of IDEs for development. By migrating existing Sun application server platforms to GlassFish, the State can save several hundred thousand dollars per year in licensing and maintenance cost.

GlassFish has been used experimentally by some agencies and is a production environment for Utah Interactive, Inc., one of the State's Web contractors. Their use has raised no issues from a development or operational perspective.

The State would then be in the business of supporting J2EE for Tomcat and some of the sustained environments, supporting JEE5 for all new development, and .NET as appropriate.

GlassFish meets the specific needs of the Tax Commission by providing an EJB3 container and it is a reference standard for JEE5 implementation. The Tax project will take several years and must be standards based so it can be deployed on future JEE5 hosting environments that the State chooses to support. Code that is JEE5 compliant developed on a GlassFish platform will be exportable to other JEE5 platform environments.

## References

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